

## INFORMATION INPUT APPARATUS

## BACKGROUND OF THE INVENTION

The present invention relates to an information input apparatus suitably used for, for instance, interactive input/output.

Computer apparatuses and the like commonly employ, under various application programs etc., what is called interactive input/output form in which the computer apparatus side presents, in the forms of a display, a prescribed response to a user's manipulation.

For example, the touch panel is commonly known as one of input devices that are used for the above type of interactive input/output. With the touch panel, a user can perform a desired manipulation by sliding, for instance, his finger in an arbitrary direction while touching the panel.

The projection display is also known which functions as a computerized white board. In this projection display, for example, a user can perform a manipulation on the white board by using a dedicated infrared-light-emitting pen.

Further, the apparatus called "Video Place" as an apparatus that is intended to provide interactive effect. Video Place is an artistic apparatus using a video camera, for instance. For example, a viewer of a Video Place apparatus causes the video camera to photograph his hand or some other part of his body as a silhouette. The viewer can enjoy a reaction or a change in an image that is displayed on a monitor device and that is a combination of an image photographed above and some other image by moving his hand or some other part of his body freely while watching the image on the monitor device.

Incidentally, to realize a more advanced interactive input/output environment, the above-described, currently available input devices have the following limits.

In the case of the touch panel, the pointing manipulation is generally limited to one using a finger. No manipulation can be performed in a space in front of the touch panel; it is necessary to cause a physical manipulation body such as a finger to contact the manipulation surface. Further, being relatively expensive, the touch panel is not appropriate for a large-size manipulation panel.

In the case of the projection display functioning as a computerized white board, although the manipulation screen can easily be increased in size, a special pointing device such as an infrared-light-emitting pen is needed as described above.

In the case of Video Place, since an interactive manipulation is realized by using a silhouette of a hand or a human body, the input/output interface is indirect and the functionality is insufficient to enable a direct manipulation.

## SUMMARY OF THE INVENTION

An object of the present invention is to provide a more advanced or enhanced interactive input/output environment.

To attain the above object, the invention provides an information input apparatus comprising a semi-transparent screen that functions as an operator input manipulation surface; pickup means for picking up an input manipulation of an operator on the semi-transparent screen by capturing only light or electromagnetic waves in a predetermined wavelength range that comes through the semi-transparent screen, to thereby produce a pickup signal; and control processing means for generating detection image information corresponding to the input manipulation of the operator based on the pickup information, and for executing a control

process based on input manipulation information that is recognized based on the detection image information.

In the information input apparatus having the above basic configuration, a physical object, for instance, that has approached the semi-transparent screen causes a variation in the state of light or electromagnetic waves entering the pickup means. In the invention, such a state variation in light or electromagnetic waves is picked up as image information. The thus-obtained image information is used as manipulation information, and a necessary control process can be executed in accordance with the manipulation information. That is, interactive input/output can be realized by producing input information by a manipulation in which some physical object capable of causing a variation in the state of light or electromagnetic waves in a predetermined wavelength range to be captured by the pickup means is made close to the semi-transparent screen or moved in its vicinity. In the invention, what functions as a manipulation panel is merely a semi-transparent screen. Since the semi-transparent screen can be formed, for instance, by combining a material for forming a transparent screen and a material for forming a semi-transparent screen, a large-size semi-transparent screen can easily be formed.

Where the above configuration is further provided with irradiating means for always irradiating the semi-transparent screen with light or electromagnetic waves to be captured by the pickup means, a medium for detection of information on a manipulation that is performed on the semi-transparent screen can be obtained easily.

The above configuration may further be provided with projection display means so that it can project, onto the semi-transparent screen, an image of visible light in an wavelength range excluding the wavelength range of light or electromagnetic waves to be captured by the pickup means, wherein the control processing means executes, as the above-mentioned control process, a display image generation process for causing the projection display means to project a display image and a control on the projection display means.

In this case, since the semi-transparent screen has a function of a display panel as well as a function of a manipulation panel, an interactive response in response to a manipulation that has been performed on the semi-transparent screen can be displayed as an image on the same semi-transparent screen.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 conceptually shows an example configuration of an interactive display system according to a first embodiment of the present invention;

FIG. 2 shows an internal configuration of a control device that is provided in the interactive display system according to the first embodiment;

FIG. 3 is a flowchart showing a process of detecting and holding reference input image levels;

FIG. 4 is a flowchart showing a process of generating detection image information;

FIG. 5 illustrates a first application example of the interactive display according to the first embodiment;

FIG. 6 is a flowchart showing a process for realizing the first application example of FIG. 5;

FIG. 7 illustrates a second application example of the interactive display according to the first embodiment;

FIG. 8 illustrates a third application example of the interactive display according to the first embodiment;